REMARKS

In view of both the amendments presented above and the following discussion, the Applicants submit that none of the claims now pending in the application is anticipated under the provisions of 35 USC § 102. Thus, the Applicants believe that all of these claims are now in allowable form.

If, however, the Examiner believes that there are any unresolved issues requiring adverse final action in any of the claims now pending in the application, the Examiner should telephone Mr. Peter L. Michaelson, Esq. at (732) 530-6671 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Abstract

The Examiner has apparently objected to the abstract as filed as being too long and using legal terminology. In response, the Applicants have enclosed a substitute abstract that remedies these alleged deficiencies.

Claim status

Independent method claim 6 has been added. The limitations of this claim are substantially parallel to those recited in independent media claim 5 which the Examiner has indicated is allowed. Hence, claim 6 should be allowed as well.

Claim 1 has been slightly amended to correct errors in antecedents. No other claim amendments have been made.

Rejections under 35 USC § 102(b)

The Examiner has rejected claims 1-4, as filed, as being anticipated under the provisions of 35 USC § 102(b) in view of the teachings of the Choi patent (United States patent 5,734,824 issued to I. P. Choi on March 31, 1998). This rejection is respectfully traversed.

For the sake of simplicity, this rejection will be specifically discussed in the context of independent claim 1. With respect to this claim, the Examiner takes the position that the Choi patent identically discloses, i.e., anticipates, all the limitations of this claim. As the Examiner will shortly appreciate, his view is not correct.

Specifically, the Examiner states as follows:

> "As shown in Figure 5, each port (Elements 50a-54a, 50b-54b and 54c) is associated with a bridge (Elements 50-54) and a filtering database (Elements 71-75). Each filtering database (Elements 71-75) 'records from which port a message enters the bridge as well as which station was the sender for that message' (Column 10, lines 57-59) until eventually, each filtering database (Elements 71-75) 'will indicate which ports on a particular bridge are associated with which stations' (Column 10, line 67 to Column 11, line 1). After the positions of the end stations are resolved, the topology of the remaining devices (Bridges and LANS, Elements 50-54 and 40-46) are resolved.

Refer to Column 13, lines 12-14 and Column 16, lines 5-12. As shown in Figure 7, a network management module (NMM) associated with each LAN determines the topology of the bridges and LANS by sending adjacency requests PDUs to other NMMs, in order to determine which LAN is adjacent to another LAN (separated by one bridge). Refer to Column 13, line 65 to Column 14, line 4 and Column 16, lines 13-52."

Network administrators must know, for proper network administration, the topology of the network which they manage if for no other reason that to easily expedite repairs, modifications and expansions of the network. While ascertaining network topology is admittedly rather simple in a small network, networks, particularly for moderate to large sized organizations can grow to thousands, if not tens or hundreds of thousands of endpoints and devices. Determining a topology of such a large network can clearly become quite a daunting task, both in terms of complexity, network resources and time required.

Further, endstations form most, typically on the order of 90%, of the devices on computer networks, with the remainder often being managed devices of one sort or another. These endstations are often other computers, such as PCs, printers or other peripherals. Each endstation has one port, but each managed device, such as a hub, router, bridge or switch, may have many ports.

As discussed in page 1, line 30 et seq of the present specification, conventionally ascertaining, i.e., discovering, the topology of such networks required determining every port of every device on the network and

then for each such port, just what other network device, is attached to that port. Doing so can entail, through use of the SNMP (simplified network management protocol) messaging, generating through a network supervisor computer (SNMP management station which may be a standalone device or implemented on a shared system) a considerable number of SNMP requests, through the network, to properly interrogate each and every managed device, specifically an SNMP agent operating thereat, on the network, and, then, using resulting SNMP responses, fully determine network topology. This topology is determined through an appropriate management application and stored in a management database. This process is also done on a fairly frequent basis in order to capture all recent changes to the network and, for proper network administration, reflect those changes in the current topology as stored in the database and frequently displayed as a network map. Consequently, such conventional schemes will, of necessity, generate considerable numbers of periodic SNMP requests, i.e., queries, and SNMP responses which will collectively increase network traffic and hence consume valuable network bandwidth, and adversely load the network devices. Obviously, considerable time will be expended by the network supervisor computer in processing the large numbers of SNMP responses to yield the network topology. As the network increases in size (ports and devices), these factors disadvantageously increase, typically exponentially with size. For those networks that contain non-SNMP devices, SNMP proxies are often used and are SNMP agents that maintain information on behalf of the non-SNMP devices. These proxies respond to SNMP requests by providing appropriate SNMP responses that provide network management data for the non-SNMP devices.

The Applicants have advantageously developed a technique that dramatically reduces the number of requests and hence responses. This, in turn, significantly reduces network traffic and conserves network bandwidth, reduces device load and considerably shortens the time required to ascertain network topology.

For example, consider an illustrative network, as described in the present specification on page 5, line 25 et seq, containing 20 managed devices, with each such device having 20 ports in use, and 400 endstations. Conventionally resolving these endstations would necessitate transmitting 400 information requests, i.e., to discover and locate each endstation connected to every port of each managed device. One request would be destined to each and every endstation. Hence, this approach functions by first resolving each managed device on the network, i.e., determining just what is connected to each and every port of that device. The present inventive technique advantageously reduces the number of requests, across all the managed devices, from 400 to 40, thus effectuating a 90% reduction and thus substantially simplifying the task of network discovery. As network sizes increase beyond 400 endstations, the savings provided by the present invention dramatically increase.

The essence of the present invention, and hence its broad teaching, is to fully resolve the endstations first -- which, given that each of the endstations has only one port and one network address, are relatively easy and quick to resolve -- and then, once the endstations are resolved, resolve the relative locations of the remaining devices which are typically managed devices. This technique

sharply contrasts with the conventional approach where the all the managed devices, relative to the endstations, are fully resolved first.

It is the Applicants and only the Applicants that have recognized this inventive approach.

As described in page 5, line 12 et seq and with reference to Figs. 1-3, the present invention specifically accomplishes this through a very simple technique. First, each port of managed device is interrogated, by a request, to specify a first destination address of any packet which that particular port has received. Then, that same port receives another request to specify a second destination address of any packet (a different packet) which that same port has received. If the answer to the second request is none, then that port must be an endstation. The result of sending these two requests for each such port identifies and hence resolves all the endstations. The ports for which two addresses are provided in response are those located on managed devices. These relative locations of these devices -- which, as noted above, number far less than the number of endstations -- are deduced from a small number of additional requests, given that the network locations of the endstations are then known.

Now, with the above in mind, the Choi patent does not determine network topology through the Applicants' present invention, i.e., by first determining the network locations of the endstations.

Specifically, the methodology taught in the Choi patent does not determine network topology down to the endstation port level -- as does the present invention. The Choi methodology determines topology between separate LANs, which are interconnected by network bridges, down to the ports on each bridge.

In that regard and as discussed in col. 6, line 22 et seq, the methodology taught by the Choi patent determines relative LAN topology by listening to Spanning Tree Protocol (STP) packets transmitted by bridges that interconnect the various LANs. This methodology does not utilize, as the present invention does, the contents of filtering databases (FDBs) of the managed devices (e.g., bridges) themselves.

The Choi methodology requires that a network management module (NMM) is located on every LAN and which listens to STP packets being sent between that LAN and another LAN and then processes the associated information. See, e.g., col. 6, lines 51-53. Were this concept to be used in a switched network, where every switch port effectively creates its own bridged LAN, then a substantial number of NMMs would be required. In contrast, the present invention, which uses information directly from the filtering databases, only requires one management station and no NMMs distributed around the network.

The Choi patent indicates, in col. 10, line 66 et seq -- which was cited by the Examiner, that eventually the FDBs for the various bridges will contain enough information to "indicate which ports on a particular bridge are associated with which [end] stations". Contrary to the

Examiner's view, this statement does not imply that the Choi patent teaches the concept of first resolving endstations before resolving other managed devices. Rather, this statement simply reflects that the FDBs will eventually store enough information to allow someone, should they wish to do so, to determine which ports have seen which endstations. There is simply no reference, whether explicit or implicit, in the Choi patent that links the stored FDB information to a determination of network topology. In that regard, the Choi patent is completely silent. This cited statement must be taken in its proper context, as reflected by the preceding sentences at col. 10, lines 53-66 which state:

> "Each message that traverses a port within a bridge contains a source or sender address, SA, of the sender NMM or station, and a destination or receiving address, DA, of the receiving NMM or station of this message. Each filtering database records from which port a message enters the bridge, as well as which station or NMM was the sender for that message. When a message enters a bridge through a port, the bridge examines the sender station address, SA, to determine that the sender station is associated with the port through which the message was received and updates a database associated with the port with the SA value. Therefore, each time a message is received into a bridge through a port, the database associated with that port is updated.",

Thus, the cited statement in col. 10, line 66 et seq, when viewed in context, simply indicates that FDB contents will reflect those ports on a bridge that have received packets and the immediately prior sending station of those packets. Clearly, one can determine, from the FDB information, those

ports through which packets have transited en route to certain endstations. However, the Choi patent does not utilize this information to determine network topology.

The present invention relies on selectively querying the FDBs in order to, as discussed above, drastically reduce the total number of requests needed to determine the complete topology of a network, down the ports of the endstations, including within each LAN and not just between them.

The Examiner has also stated at the beginning of paragraph 3 of the action: "Choi discloses in Figures 5 and 7 a method for discovering the topology for a network comprising initially resolving the positions of the endstations (endstations; Figure 5, elements S1-S6)". From viewing Figure 5, one realizes that the Choi patent only partially resolves the positions of the endstations. In this regard and for bridge 52, port 53b can only resolve that it is connected to two endstations, namely S1 and S2. Details on how endstations S2 and S1 are connected to LAN 5 (42) remain unresolved. There is simply no description in the Choi patent as to how LAN 5 (42) and the position of ports S1 and S2 are resolved.

Now turning to the managed devices, it is clear from Figure 5 and its accompanying discussion in col. 10, line 31 et seq, that bridge 4 (52) resolves that port 52a has received messages from endstations s6, S5, S3 and S4. However, what is not clear and in fact is not described by the Choi patent is how bridge 52 determines what port of LAN 40(2) to which endstation S4 is connected or what port

in that LAN connected to port 50a of bridge 1 (50) through which endstation S3 communicates, and so forth.

Hence, the Choi patent completely fails to teach properly and fully resolving all the endstations, let alone before all other managed devices on the network are themselves fully resolved. This concept has been left for the Applicants and only the Applicants to teach -- which they now do.

Claim 1 contains suitable distinguishing recitations directed to the present invention. In that regard, this claim recites as follows, with those recitations shown in a bolded typeface:

> "A method for discovering the topology of a network comprising:
> **initially resolving positions of end stations on the network, and subsequently resolving the topology of remaining devices on the network.**" [emphasis added]

Media claim 4 incorporates the limitations of claim 1.

As such, the Applicants submit that neither claims 1 nor 4 is anticipated by the teachings of the Choi patent. Thus, both of these claims are patentable under the provisions of 35 USC § 102(b) over this reference.

Furthermore, each of claims 2-3 depends on independent claim 1 and recites further distinguishing features of the present invention. Accordingly, each of these dependent claims is not anticipated by the teachings of the Choi patent for the same exact reasons set forth

above with respect to claim 1 and hence is patentable over these teachings.

Allowed Claim

The Examiner has allowed claim 5, which the Applicants appreciate.

Conclusion

Thus, the Applicants submits that none of the claims, presently in the application, is anticipated under the provisions of 35 USC § 102.

Consequently, the Applicants believe that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited on **March 30, 2004** with the United States Postal Service as first class mail, with sufficient postage, in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Peter L. Michaelson — Signature

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